MODEL DEVELOPMENT OF ESTIMATING OIL DISCHARGE FOR SUSTAINABLE GREEN PORT

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ABSTRACT

Port is indeed a complex system build up from multi-subsystem, i.e. ecology, technology, economy and most importantly the community of human workforce within. As for the range of activities occurred within the port has been globally diversified, the port size also urged to expand. To that extend, maintaining port operation, has degraded the magnitude of responsibility towards the environment's concern. Fulfilling the need, this study was conducted to highlight the important of green port. This will be done by investigating the sources and impact from oil pollution that occurred at the terminal port container. Conducting the study, a set of objectives was established; to design and develop System Dynamics (SD) model of environmental sustainable green port operation, and to suggest mechanism for minimizing the oil pollution based upon the developed model. In order to do that, SD's computer simulation was designated by using Vensim^{TM} Software. The model demonstrating the oil pollution's time based design analysis which propagate the interrelation of all the causes and repercussions involved. A case study was exclusively selected on oil discharge that occurred within Port Tanjung Pelepas (PTP), Johor. From the basis of previous record provided by PTP Marine Department, equations model was derived prior to the development of the SD simulation. Calculation of Cohen's Kappa for the model construct was calculated with value of 0.671. From the simulation result, it was found that, the oil discharge is expected to be significantly increased annually. Provided that there is no preventive measure was taken, in range of 20 years' time, more than 350, 000 m^3 is expected to be observed. Treatment cost may speed up to RM30 billion annually by year 2035. On that basis, this study suggests that countermeasures need to be taken by implementing higher security level at the port and provide training about the importance of environment.

ABSTRAK

Pelabuhan dikenali sebagai suatu sistem kompleks yang bertindak oleh pelbagai ekologi, teknologi, ekonomi dan masyarakat faktor. Pada masa kini, semua pelabuhan di dunia menjadi lebih besar dengan lebih banyak aktiviti yang terlibat. Tanggungjawab terhadap alam sekitar semakin berkurangan, terutamanya bagi mengekalkan operasi pelabuhan, dan meminimumkan risiko kepada alam sekitar. Oleh itu, kajian ini memberi penekanan kepada kepentingan pelabuhan hijau dan mengenalpasti punca dan kesan pencemaran yang berlaku di pelabuhan terminal kontena. Objektif kajian ini adalah untuk mereka bentuk dan membangunkan Sistem Dinamik (SD) model operasi pelabuhan hijau lestari alam sekitar dan mencadangkan peningkatan pencemaran minyak berdasarkan model maju. Oleh itu, SD adalah pendekatan simulasi komputer untuk menganalisis dan menyelesaikan masalah yang kompleks dan rumit, memberi tumpuan kepada reka bentuk dan analisis dari masa ke masa yang menunjukkan hubungan sebab dan kesan system itu. Vensim Perisian telah digunakan dalam usaha untuk membangunkan model. Di samping itu, kajian ini memberi tumpuan hanya kepada pembuangan minyak yang berlaku di Pelabuhan Tanjung Pelepas (PTP). Tambahan pula, data masa lalu dari Jabatan Laut di PTP digunakan untuk merumuskan persamaan model sebelum melakukan penyelakuan. Bahagian-bahagian penting dalam melakukan kajian ini adalah dan pengesahan model. Pendekatan “Cohen Kappa” telah digunakan untuk mengesahkan model. Selepas simulasi, didapati bahawa pelepasan minyak akan terus meningkat sehingga 20 tahun akan datang sekiranya tiada langkah pencegahan diambil. Model ini juga diunjurkan untuk 20 tahun akan datang dan pelepasan minyak mungkin lebih daripada 350, 000 m^3 setahun menjelang 2035. Tambahan pula, kos anggaran untuk rawatan pencemaran minyak adalah mungkin mencapai RM30 bilion setahun menjelang 2035. Kemudian, penambahbaikan dengan pelaksanaan keselamatan yang ketat di pelabuhan dan menyediakan latihan mengenai kepentingan alam sekitar.